Validation of Maternally Reported Birth Weights Among 46,637 Tennessee WIC Program Participants

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Synopsis

To assess the accuracy of maternally reported birth weights, we compared birth weights reported by mothers in the Tennessee Women, Infants, and Children Supplemental Feeding Program (WIC) from 1975 to 1984 with the birth weights recorded on the corresponding Tennessee birth certificate file. Differences in birth weights between these two sources were compared for the total group and were also stratified by sociodemographic and medical variables that might influence the accuracy of birth weight recall. An accurate birth weight was defined as one reported within 1 ounce of the birth certificate birth weight. We also calculated the proportion of birth weights that would be incorrectly classified as low or normal by maternal reporting.

A total of 72,245 WIC records were matched with their corresponding birth certificates. Of these, 46,637 had WIC birth weights recorded within the specified birth weight range. Eighty-nine percent of birth weights were reported within 1 ounce of birth certificate birth weights. Lower accuracy of birth weight reporting was associated with the infant's low birth weight, preterm delivery, and low Apgar scores, and with the mother's grand multiparity, less than a high school education, black race, single marital status, and young age. Only 1.1 percent of birth weights would have been incorrectly classified into low or normal birth weight categories based on maternal reporting. Overall, our results suggest that maternally reported birth weights are sufficiently accurate for research and programmatic purposes when birth certificate information is not readily available.

BIRTH WEIGHT IS RECOGNIZED as an important measure of pregnancy outcome as well as a powerful predictor of the infant's subsequent health status. Low birth weight is associated with higher neonatal and infant mortality, poor growth, and possible neurologic or developmental deficits (*1-10*). Many public health programs designed to improve pregnancy outcome in high-risk populations use birth weight to evaluate the effectiveness of the program's intervention. Additionally, because of its obvious importance as both an outcome and a risk variable, birth weight is often used in epidemiologic and clinical investigations. In such programs and investigations, birth weight is frequently obtained by maternal recall. Few studies, however, have examined the accuracy of this source of birth weight ascertainment. If such data are to be used for research or programmatic purposes, clearly it is important to assess their validity. In this paper, we examined this issue by comparing the accuracy of birth weights reported by mothers participating in the Tennessee Women, Infants, and Children Supplemental Feeding Program (WIC) with birth weights recorded on corresponding Tennessee birth certificates.

Methods

Using the SAS statistical package, we linked the Tennessee WIC pediatric files from 1975 to 1984 with the corresponding Tennessee birth certificate files (*11*). The WIC files consisted of data col-

Table 1. Distribution of differences between maternally reported birth weights and birth certificate birth weights, Tennessee 1975–84

Absolute difference	Frequency	Percent	Cumulative percent
0 oz	32,910	70.6	70.6
1 oz	8,584	18.4	89.0
2 oz	782	1.7	90.6
3 oz	435	0.9	91.6
4 oz	412	0.9	92.5
5–8 oz	1,204	2.6	95.0
More than 8 oz	2,310	5.0	100.0
Total	46,637	100.1	100.0

Table 2. Percent difference between maternally reported WIC birth weights and birth certificate birth weights by selected variables, Tennessee 1975–84

Variable	Percent accurately reported within—			P value (df = 2)
	0 oz	1 oz	>1 oz	
Birth weight:				
Less than 5 lbs, 8 oz	64.8	17.7	17.4	<0.0001
5 lbs, 8 oz or more	71.0	18.8	10.2	
Gestational age:				
Less than 37 weeks	67.2	18.5	14.3	<0.0001
37 weeks or more	71.4	18.4	10.3	
Apgar 1-minute score:				
Less than 7	67.3	20.3	12.5	<0.0001
7 or more	71.3	18.6	10.2	
Apgar 5-minute score:				
Less than 7	64.8	17.8	17.5	<0.0001
7 or more	71.0	18.8	10.2	
Previous live births:				
0–3	71.0	18.4	10.7	<0.0001
4–12	60.7	17.8	21.5	
Marital status:				
Single	67.6	18.3	14.1	<0.0001
Married	71.4	18.4	10.1	
Maternal education:				
Less than high school	69.3	18.9	11.7	<0.0001
High school or more	71.8	18.0	10.2	
Maternal race:				
Black	65.1	17.4	17.4	<0.0001
White	71.9	18.7	9.4	
Maternal age:				
Less than 18 years	71.7	18.6	9.7	<0.01
18 years or more	70.4	18.4	11.2	
Child's age:				
Less than 1 year	70.8	17.6	11.6	>0.05
1 year or more	70.7	18.7	10.6	

lected on WIC clinic visits and submitted to the Centers for Disease Control, Public Health Service, as part of the Pediatric Nutrition Surveillance System, a system to monitor the nutritional status of high-risk children.

The WIC records were linked with birth certificate records by matching the child's last name, first initial, and date of birth. All cases with multiple matches (that is, WIC records with more than one birth certificate match) were eliminated. We limited our analysis to singleton births with reported WIC birth weights and birth certificate birth weights between 1 and 13 lbs (approximately 500–5,999 g). Because most infants have multiple WIC visits, only the first WIC visit was used.

Differences between maternally reported WIC birth weights and birth certificate birth weights were determined for the entire cohort. To assess the effect of time on birth weight recall, we stratified recall accuracy by the period between the child's birthdate and the date of the first WIC visit. We then examined subgroups differentiated by factors that might have influenced the accuracy of birth weight recall and reporting. These factors included birth weight (less than 5 lbs, 8 oz, [2,500 g]; 5 lbs, 8 oz or more); gestational age (less than 37 weeks, 37 weeks or more); previous live births (0–3, 4 or more); Apgar scores (less than 7, 7 or more); maternal age (less than 18 years, 18 years or more); maternal education (less than 12 years, 12 years or more); race (black, white); marital status (married, unmarried); and the child's age calculated as the time between the child's birthdate and the date of visit (1 year or less, more than 1 year). The chi square test was used to detect significant differences in birth weight agreement among these various groups.

Birth weight is frequently dichotomized into low and normal birth weight groups using 2,500 g or 5 lbs, 8 oz as a dividing point. We therefore assessed the proportion of birth weights in our sample that would have been incorrectly included in either group based on maternal reporting for the entire sample as well as for the various subgroups as described previously.

Birth weights were recorded to the nearest whole ounce in both data sets; we rounded values of 0.5 oz or greater to the next whole ounce. To allow for lack of recall or recording of these 0.5-oz differences, we considered any reported birth weight within ± 1 ounce (approximately 29 g) of the birth certificate birth weight as accurate.

Results

A total of 84,006 records were included in the 1975–84 WIC file. Eighty-six percent (72,245) of WIC records were successfully matched with their corresponding birth certificate. Of these, 46,637 (65 percent) had WIC birth weights recorded and fell within the specified birth weight range.

In our sample, 80 percent of mothers were white

Table 3. The proportion of birth weight group misclassification into low birth weight and normal birth weight categories by selected variables, Tennessee 1975–84

Group	Misclassified (percentages)		
	Total	As low birth weight	As normal birth weight
Total sample	1.1	0.8	0.3
Low birth weight	3.9	0.0	3.9
Gestational age less than 37 weeks	2.6	1.6	1.0
Black mothers	1.9	1.3	0.6
Unmarried	1.7	1.1	0.6
4 or more previous live births	1.3	0.9	0.4
Low 1-minute Apgar score	1.3	0.9	0.4
Low 5-minute Apgar score	1.2	0.9	0.3
Less than 12 years education	1.2	0.9	0.3
Maternal age less than 18 years	1.1	0.8	0.3
Child's age	1.0	0.7	0.3
Normal gestational age and normal birth weight	0.7	0.7	0.0

and 20 percent, black; 77.5 percent were married; 50 percent had less than a high school education; and only 3.5 percent had had four or more live births. The low birth weight rate for the total group was 7.4 percent, with a rate of 11.3 percent for blacks and 6.8 percent for whites. Twenty percent of the children were preterm.

Seventy-one percent of the maternally reported birth weights were identical to those recorded on the birth certificate, and 89 percent of birth weights were reported within 1 ounce of the birth certificate birth weights (table 1). Ninety-five percent of the reported birth weights were within 8 ounces of birth certificate birth weights.

Lower accuracy of WIC-reported birth weights was associated with the infant's low birth weight, preterm delivery, and low Apgar scores, and the mother's grand multiparity, less than a high school education, black race, single marital status, and being under 18 years (table 2). Differences for each of these variables were significant at the P less than 0.0001 level except for being under 18, which had a P less than .01.

Overestimation and underestimation of birth weight by mothers can affect both the birth weight distribution and the correct classification of children into categories such as low birth weight. We found overall that the women who incorrectly reported their child's birth weight were more likely to underestimate than overestimate (22.6 percent versus 6.8 percent). This underestimation resulted in a 0.2-ounce (approximately 6 g) lower mean birth weight for the maternally reported birth weights compared with birth certificate birth weights. These results were similar for the various subgroups we examined except for the mothers of low birth weight children. These mothers had a higher percentage of overestimation (9 percent) and a mean maternally reported birth weight that was 0.6 oz (approximately 17 g) higher than the mean birth certificate birth weights for the same children.

When we examined how errors in maternal reporting would affect the classification of children into low and normal birth weight categories, we found that only 1.1 percent of births would have been misclassified. Of all the variables found to be significantly associated with decreased accuracy in reporting, the low birth weight group had by far the highest misclassification rate, 3.9 percent (table 3).

The child's age did not seem to affect the mother's recall of birth weight. Recall accuracy was 88.4 percent for mothers of children less than 1 year old and 89.0 percent for those of children 1 year old or older. This difference was not statistically significant.

Discussion

In this investigation, we demonstrate a high degree of accuracy of maternally reported birth weights. In our study, 70 percent of the WIC records showed exact agreement with birth certificate birth weights. This percentage is at least as high as that found in other similar studies (*12–14*). Allowing reported birth weights and birth certificate birth weights to differ by 1 ounce improves accuracy markedly. In our study, the rate rose to 89 percent. Differences of up to 1 ounce may arise if the birth weights are recorded on the birth certificates to the nearest one-half ounce, but the

mother is told the birth weight rounded to the nearest whole ounce. Additionally, babies (especially low birth weight infants) may be weighed on kilogram scales, and mothers may be given an approximate total in pounds of the gram measurement actually recorded on the birth certificate. Errors may also occur in recording the weight on the birth certificate or recording the mother's report of the birth weight on the WIC form.

The finding that only 1 percent of births would have been misclassified into the low or normal birth weight category is important, because much higher rates have been noted previously (*15*). Even for women with the lowest reporting accuracy, the proportion of misclassified birth weights was still less than 4 percent. We feel that maternally reported birth weight data are probably acceptable in studies using dichotomous birth weight categories to compare outcomes and risks if birth weights from birth certificates or hospital records are not easily available. Using maternally reported birth weights would only slightly underestimate the number of low birth weight babies and decrease the observed differences between normal and low birth weight infants. Any resultant bias probably would be small and would tend to underestimate the birth weight's effect on a dependent variable. Because of the ease in using WIC and similar maternally reported data to evaluate health status in high-risk populations, this finding has obvious practical importance.

Although several of the risk variables were associated with significant differences in reporting accuracy among their substrata, low birth weight and low gestational age appear to have the greatest effect on the accuracy of birth weight reporting. Interestingly, such medical variables as birth weight, gestational age, and Apgar scores were at least as important in predicting the accuracy of maternally reported birth weight as maternal sociodemographic variables such as age, race, and education. Problems noted at birth may negatively affect the mother's recall of birth weight. By contrast, with healthy, full-term babies, birth weight and birth length comprise the sole accompanying pieces of information for mothers to remember. Lower accuracy of birth weight reporting among black mothers may be confounded by the higher rate of low birth weights.

Predicting the extent to which the accuracy level demonstrated in this subset of mothers applied to other populations is difficult. Participation in a program such as WIC that emphasizes health events and health outcomes might actually reinforce the importance of health-related information such as birth weight among mothers. Alternatively, recall may be poorer in the WIC population, which is composed of primarily low-income, less-educated mothers.

We used birth certificate data as the "gold standard" in this analysis. A previous comparison of birth weights on birth certificates with hospital records, which might be considered the primary source, showed 92 percent exact agreement between these two sources (*16*). Without actual hospital data available, however, predicting whether maternal reporting would be closer to or further from hospital record birth weight is difficult.

Overall, our results suggest that maternal birth weight recall is sufficiently accurate for research and programmatic purposes when birth certificate information is not readily available.

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MATCH: A Maternal and Child Health Information Network

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Synopsis

The Maternal and Child Health Information Network—MATCH—was begun in 1984 as a demonstration project with support from the Division of Maternal and Child Health of the Health Resources and Services Administration, Public Health Service. The primary purpose of the project was the development of a system to manage data related to prenatal, child health, family planning, and genetic services that are delivered with State support in clinics in the State of Ohio. The design of MATCH enables the same data base to be used at both the State and local levels. Because it allows all participants, central and district, to manipulate the raw data, it is called an end-user—as opposed to a batch retrieval—system.

Data recorded on individual forms during each client's visit to local service clinics are collected and entered into a microcomputer whose software package is a commercial data base. The clinic can then use the data for its purposes: program planning, management, evaluation, client referrals, appointment followup, quality control, and billing. The same data are also uploaded by central office staff to the State's DEC mainframe from data-filled disks mailed in by the clinics. Personnel who staff local projects can access their own data on the mainframe computer to generate reports for local use and send and receive messages electronically. That is, the system is "interactive."

The intent is to first link data generated by the primary care and preventive programs of maternal and child health (MCH) in an information system, then link that system to other health data arriving at the State health department (for example, birth and death certificates), and, finally, to use the system as the basis for a State level MCH primary care data system in Ohio for surveillance, planning, management, quality control, accountability, and research purposes.

ONE OF TWO MAJOR PURPOSES of the first White House Conference on Children, which was convened by President Theodore Roosevelt in 1910, was the gathering of information to plan programs and set priorities. Led by Jane Addams and Lillian Wald, advocates for maternal and child health (MCH) care were actually seeking rational planning at the Federal level for children's services. Since the beginning days of MCH programs, the activities for attaining program objectives have included the investigation of needs, reporting to the professionals and public, education and training, research and development, and management of service programs. All of these tasks entail the use of data.

Formalized data collection became a goal when the Children's Bureau was formed in 1912. About 25 years ago, when Congress became interested in holding agencies accountable for dollars that had been appropriated for reaching specific program objectives, program evaluation was added to the list of purposes for which data were needed. More recently, other uses of data have been emphasized: disease surveillance, advocacy, quality control,